# Complete Summary

## GUIDELINE TITLE

Fever without source.

## BIBLIOGRAPHIC SOURCE(S)

McAlister WH, Strain JD, Cohen HL, Fordham L, Gelfand MJ, Gunderman R, Slovis TL, Smith WL, Rodriquez W, Expert Panel on Pediatric Imaging. Fever without source. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 4 p. [32 references]

## GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: McAlister WH, Kushner DC, Babcock DS, Cohen HL, Gelfand MJ, Hernandez RJ, Parker BR, Royal SA, Slovis TL, Smith WL, Strain JD, Strife JL, Rodriguez W. Fever without source. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):829-32.

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

## COMPLETE SUMMARY CONTENT



## SCOPE

### DISEASE/CONDITION(S)

Fever without source (FWS)

### GUIDELINE CATEGORY

Diagnosis

### CLINICAL SPECIALTY

Family Practice
Pediatrics
Radiology

### INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

### GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for patients with fever without source (FWS)

### TARGET POPULATION

- Infants and children with fever with no respiratory signs or symptoms
- Children with cancer and neutropenia with no respiratory signs or symptoms

### INTERVENTIONS AND PRACTICES CONSIDERED

Chest x-ray

### MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of peer-reviewed medical journals and the major applicable articles were identified and collected.

### NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

## METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

## RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

## METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

## DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

## METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

## DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed for reaching agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1 to 9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty percent agreement is considered a consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by the Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

### COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

### METHOD OF GUIDELINE VALIDATION

Internal Peer Review

### DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Fever without Source (FWS)

Variant 1: Infant or child greater than one month of age with no respiratory signs or symptoms.

| Radiologic Exam Procedure | Appropriateness Rating | Comments |
|---|---|---|
| X-ray, chest | 2 | |
| Appropriateness Criteria Scale<br>1 2 3 4 5 6 7 8 9<br>1 = Least appropriate 9 = Most appropriate | | |

Variant 2: Child with cancer and neutropenia. No respiratory signs or symptoms.

| Radiologic Exam Procedure | Appropriateness Rating | Comments |
|---|---|---|
| X-ray, chest | 3 | |
| Appropriateness Criteria Scale<br>1 2 3 4 5 6 7 8 9<br>1 = Least appropriate 9 = Most appropriate | | |

The febrile pediatric patient, especially an infant, represents a dilemma for the primary care physician. The source of the fever can vary from a brief, minor illness to a life-threatening infection and often cannot be found despite a careful history and physical examination. Fever without source (FWS) or fever without localizing signs (FWLS) is an acute febrile illness of which the origin of the fever is not apparent after initial careful history and examination. The term fever of unknown origin (FUO) generally refers to a fever lasting two weeks or more without an apparent etiology, but the definition of FUO remains controversial. Other investigators have used 7 to 10 days of fever rather than two weeks to define FUO. The definition of fever is generally regarded as a rectal temperature of 38 degrees centigrade or higher. Oral temperatures are fairly unreliable, although they are the usual method of measuring temperature in older children and adults.

The cause of fever in the pediatric patient can often be determined from the history, physical examination, and laboratory tests. A thorough history is important as medications, foreign travel, pets, or prior illnesses could direct the clinical investigation and imaging to the fever cause, as could awareness of prior abdominal inflammation processes such as Crohns, recent surgery for appendicitis, etc. The yield from the physical examination is not recorded in most studies of FUO other than to note that diagnostic testing was guided by the physical examination. Two studies report that almost 60% of the patients examined had abnormal findings that contributed to the eventual diagnosis. Traditionally, febrile infants younger than three months are hospitalized. The cerebral spinal fluid is examined, the blood and urine are cultured for pathogens, and empiric antibiotics are given. In addition, a chest radiograph has been part of most protocols and practices. Hospitalization for all febrile infants in the first several months of life has been shown to be an expensive management strategy and can incur significant iatrogenic complications. The infants in this category have somewhere between 3% to 10% incidence of what would be designated as a serious bacterial infection (SBI). Two clinical protocols such as the Rochester Criteria and the Milwaukee Criteria, along with various laboratory tests, have been offered to help determine the probability of an SBI in infants with a febrile illness. The use of strict screening criteria can permit a substantial number of febrile one- to two-month-old infants to be treated as outpatients and without antibiotics.

How often noninvasive testing has provided a diagnosis in FUO cases is difficult to determine. In adults it is stated to be perhaps one quarter. An example of serological testing that could lead to a diagnosis would be in generalized systemic Bartonella henselae where children seem to be prone to develop prolonged fever.

For infants who have fever and chest symptoms, most investigators feel that chest radiographs are indicated and are useful. Therefore, an infant with bronchiolitis or upper respiratory infection does not have a true FWS or FWLS. Clinical factors predictive of pneumonia in children of all ages have been studied. The presence of rales is the single best clinical indicator of pneumonia in infants and children. Tachypnea and fever are also predictive findings for pneumonia in the pediatric population.

One study recommends that chest radiographs be obtained only in patients 3 through 36 months of age with fever when there are clinical manifestations of chest disease or when the patient appears toxic. This same study reported a 3.3%

incidence of positive chest radiographs based on collected reviews of infants and children from birth to 36 months of age with fever and no respiratory symptoms or signs. A different researcher, summarizing a number of clinical series dealing with acute episodes of fever in infants, also believes that chest radiographs should be obtained only when there are clinical indications. Another study combined data of three investigations and subjected them to a statistical meta-analysis by using methods described in recent medical literature. The larger number of patients in the combined study allowed more valid conclusions concerning the accepted practice of performing chest radiographs in febrile infants as part of the sepsis workup. These three series had 671 infants. In 361 infants with no clinical evidence of pulmonary disease on history and physical examination, all had normal chest radiographs. A finding of only hyperinflation on a chest radiograph was interpreted as normal because it was felt that the infants would likely have a viral illness or reactive airway disease and would not usually be receiving antibiotics, unlike older children and adults. This study indicated that a chest radiograph in a patient with no pulmonary symptoms or signs would be positive <1.2% of the time. In the same series, nearly one-third of 256 infants with clinical manifestations of pulmonary disease had a positive chest radiograph; therefore, in symptomatic, febrile infants, a chest radiograph can help identify significant pulmonary disease and should be obtained.

One group of researchers retrospectively studied 105 infants who had fever. Of the 37 patients who had no respiratory symptoms or signs, there was one chest radiograph that showed a focal parenchymal infiltrate. Hyperinflation and peribronchial thickening were not classified as abnormal. In a prospective study the same authors included 121 infants who were free of signs of lower tract respiratory symptoms and signs but who had fever. None had chest radiographs that showed an abnormality. These data suggest that obtaining chest radiographs to look for parenchymal infiltrates treatable by antibiotics for infants less than two years old is necessary only in those infants who have clinical evidence of lower respiratory illness. Another study concluded that in febrile infants younger than three months of age, a chest radiograph should be obtained only when signs of respiratory disease are present. In this series the incidence of pneumonia in infants without respiratory manifestations was 6%, and all those infants did well, having only mild infiltrates on their chest radiographs. The case for not obtaining chest radiographs in the absence of pulmonary clinical manifestations also applies to the pediatric population beyond infancy but is not as well documented as in infants.

A child with cancer who is febrile and neutropenic is often evaluated with a chest radiograph in addition to other assessments, including cultures of the blood and urine. The practice of routinely including a chest radiograph has been challenged by investigators who point out that the incidence of pneumonia is low with fever and neutropenia. The rate is between 3 to 6% and is still lower in children with no respiratory symptoms. In one study, 54 children with cancer were hospitalized for hundreds of episodes of fever and neutropenia, and the children without respiratory findings had no evidence of pneumonia on chest radiographs. In the same study, children who did not have chest radiographs showed no significant outcome differences from those who did. In patients with fever lasting longer than three weeks without localizing signs or symptoms, special imaging studies such as computed tomography (CT) or ultrasound rarely lead to a diagnosis. In patients with fever for more than three weeks and no localizing clinical findings, gallium 67

scanning is of little value. Indium-111 granulocyte scintigraphy performed better than fluorine-18 fluorodeoxyglucose in adults.

Most investigators feel that a chest radiograph should remain part of a sepsis evaluation in the neonate. Some will obtain a chest radiograph in a septic appearing pediatric patient without an apparent focus of infection because the radiograph may disclose an occult (pleural, parenchymal, or pericardial) source of the fever. In addition, a chest radiograph will help exclude congenital or acquired cardiac disease in a child who is febrile and ill.

Most data support the opinion that chest radiographs in the febrile patient should be obtained only when there is clinical evidence of a respiratory illness. One should be able to assess the cost benefit and risk benefit ratios for each test. In the case of radiologic evaluation the cost and risk of radiation exposure, albeit small, must be weighed against the diagnostic information provided. The incidence of serious bacterial infection (SBI) is low but does prompt costly evaluations in infants with FWLS. Clinical variables are guidelines for the physician, not a substitute for overall clinical judgment in the decision of which febrile infants and children would benefit from chest radiographs. When a child with an FUO is in a hospital setting, a sonogram or CT of the abdomen may be requested in addition to a chest radiograph. CT of the chest may also be requested. If the patient is immune compromised, these imaging requests are even more frequent. Data supporting these approaches are lacking, which is not to say that they are inappropriate but rather that they lack good documentation of their value.

### CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

Selection of appropriate radiologic imaging procedures for evaluation of patients with fever without source (FWS)

### POTENTIAL HARMS

Not stated

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better

### IOM DOMAIN

Effectiveness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

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### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

1995 (revised 2005)

### GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

### SOURCE(S) OF FUNDING

American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

### GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Pediatric Imaging

### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: William H. McAlister, MD; John D. Strain, MD; Harris L. Cohen, MD; Lynn Fordham, MD; Michael J. Gelfand, MD; Richard Gunderman, MD, PhD; Thomas L. Slovis, MD; Wilbur L. Smith, MD; William Rodriguez, MD

### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

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The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

### GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

ACR Appropriateness Criteria® Anytime, Anywhere™ (PDA application). Available from the ACR Web site.

Print copies: Available from American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

### AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

### PATIENT RESOURCES

None available

### NGC STATUS

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